

EFFECTS OF SOUTHERN CALIFORNIA WILDFIRES ON STORM WATER METALS & PAHS

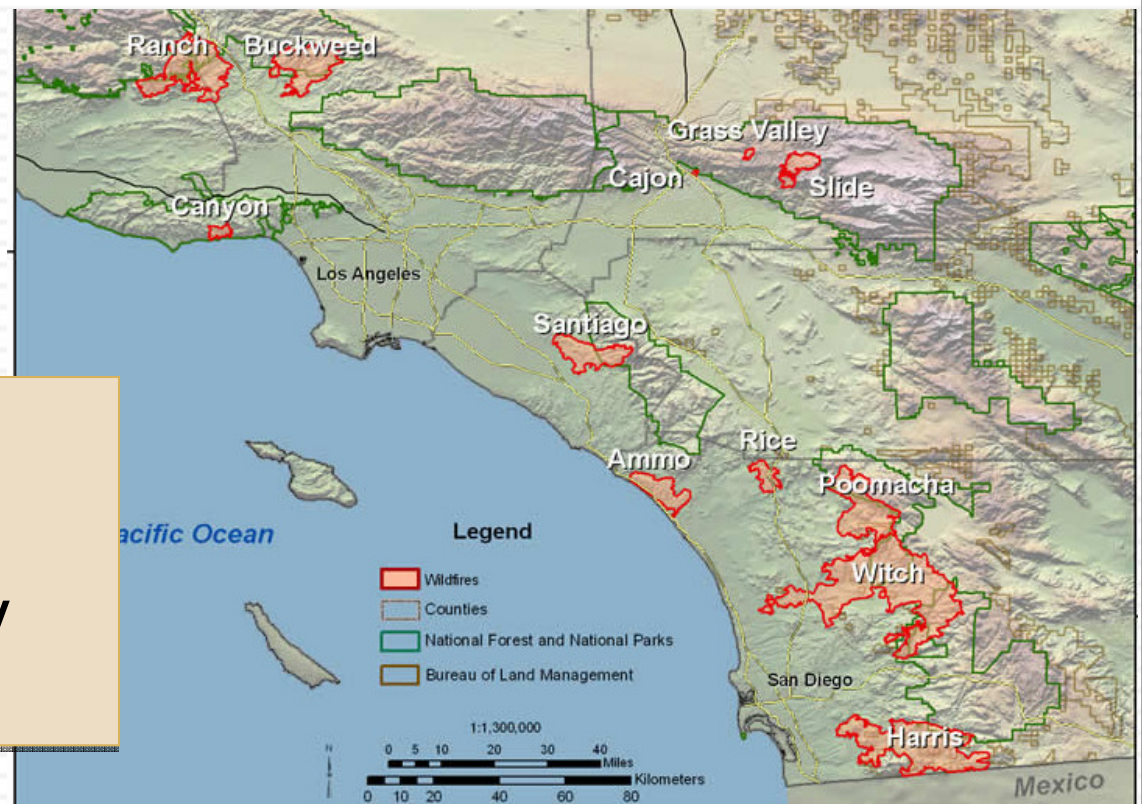
Eric D. Stein

S. Ca. Coastal Water Research Project

Fire in Southern California

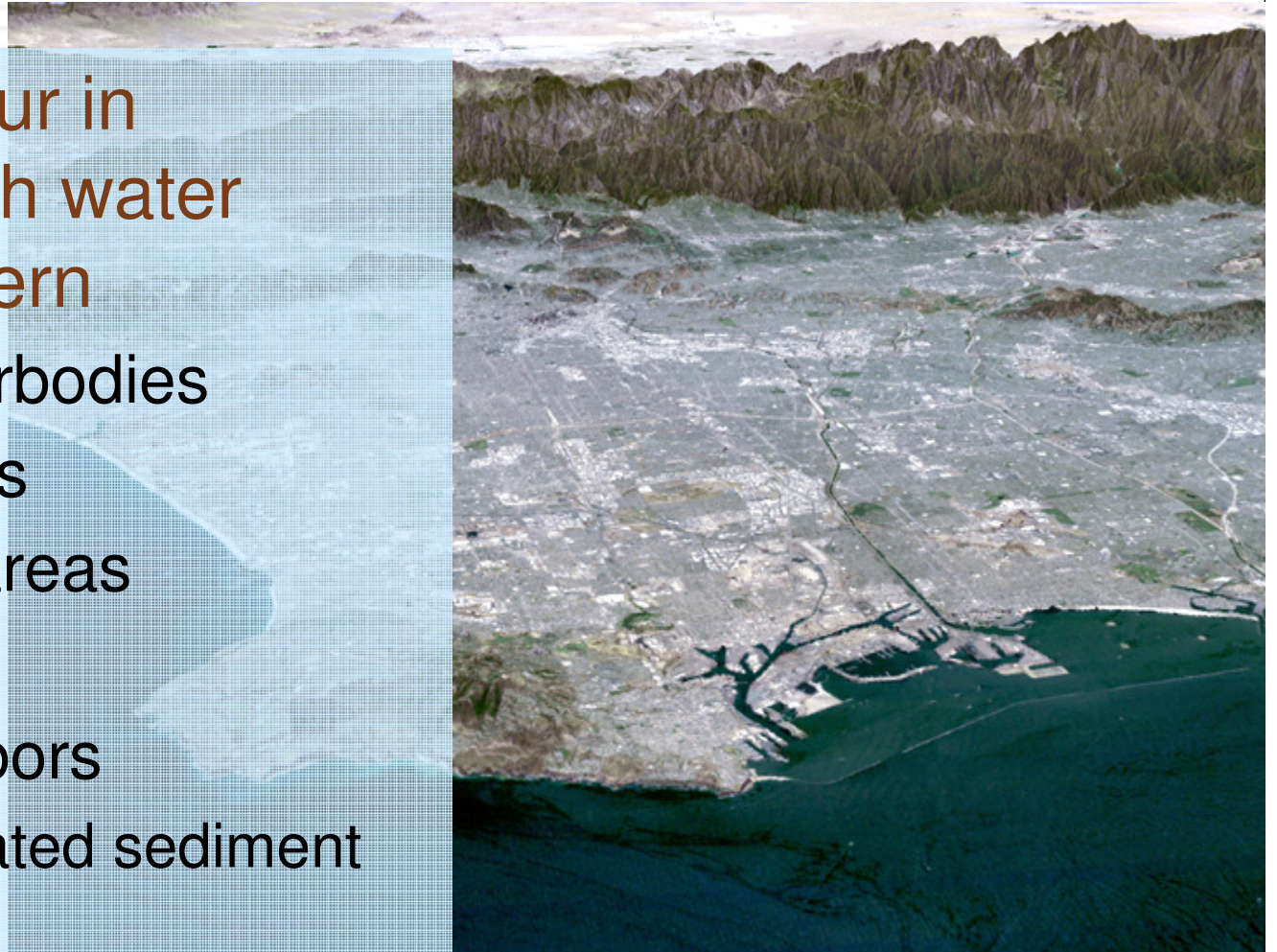
- Fire is a regular occurrence in S. California
- Frequency of fires increasing
- Fire alters runoff patterns
 - ▣ Higher flows
 - ▣ More sediment
 - ▣ More nutrients

Little is known about
effect of post-fire
runoff on water quality



Downstream Effects of Fire

- Fires often occur in watersheds with water bodies of concern
 - ▣ Impaired waterbodies
 - ▣ Sensitive areas
 - ▣ Recreational areas
 - ▣ Estuaries
 - ▣ Ports and harbors
 - Contaminated sediment



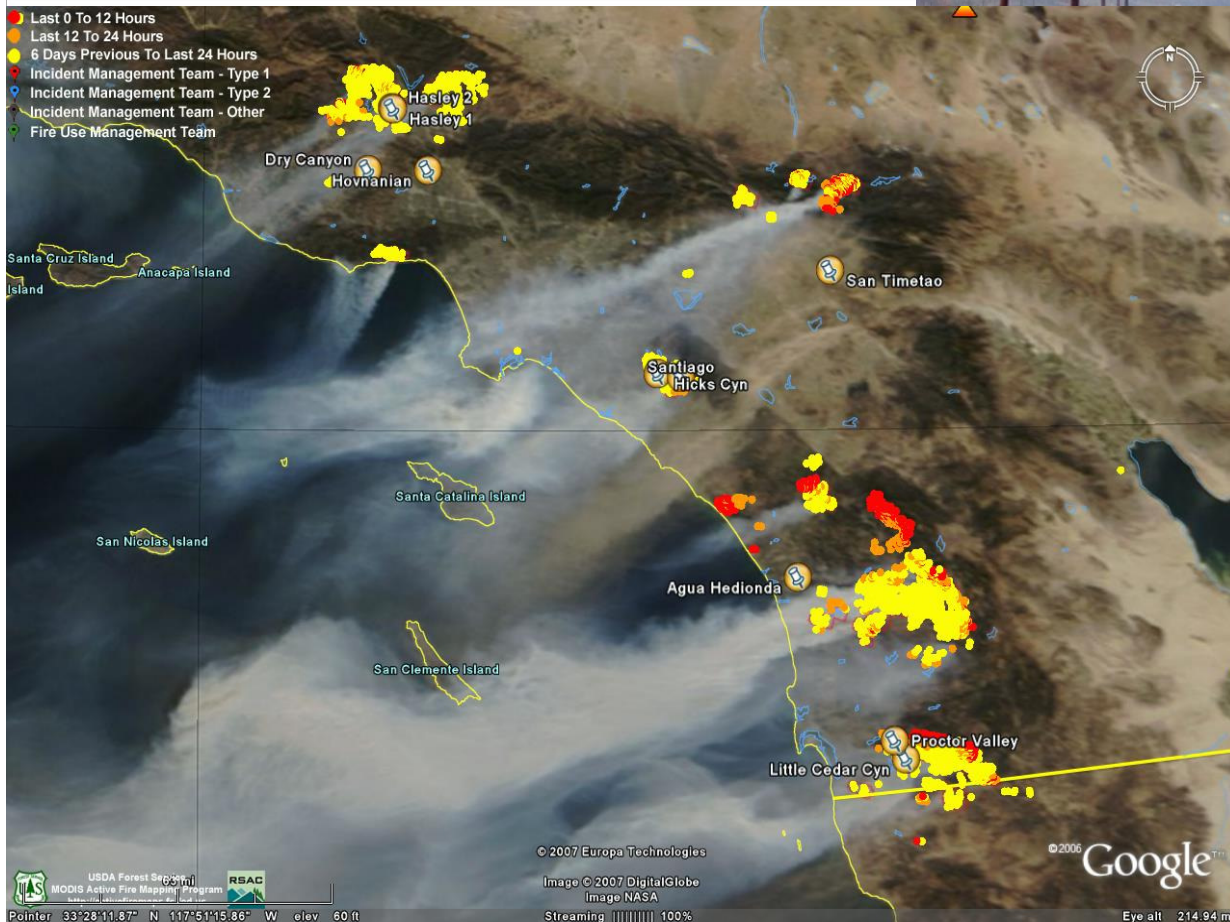
Key Management Questions



- What is the pollutant loading from burn areas?
- How long does fire-related loading persist?
- What is the effect of aerial deposition and subsequent washoff of ash on storm water loading?
- What are the appropriate management strategies to address post-fire pollutant runoff?

Potential Source Pathways

Direct effects



Indirect Effects

Our Studies

Studies of Direct Effects

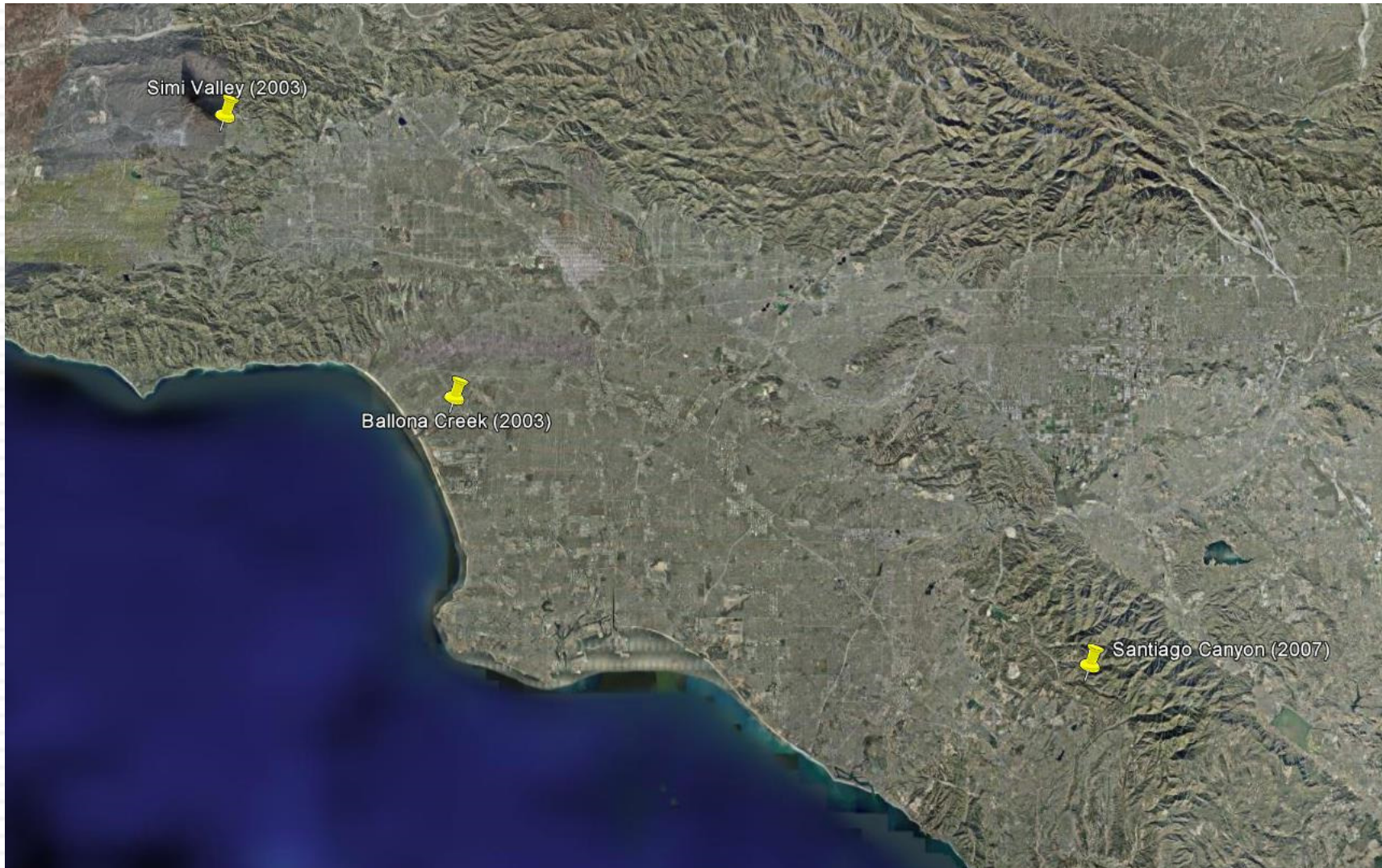
- 2003 Simi Valley Fire
 - ▣ Paired watershed study
 - 1 burned/1 unburned
 - ▣ 3 storms sampled each watershed post fire
- 2007 Santiago Canyon Fire
 - ▣ Pre vs. post fire study
 - ▣ 2 storms pre fire + 2 storms post fire

Studies of Indirect Effects

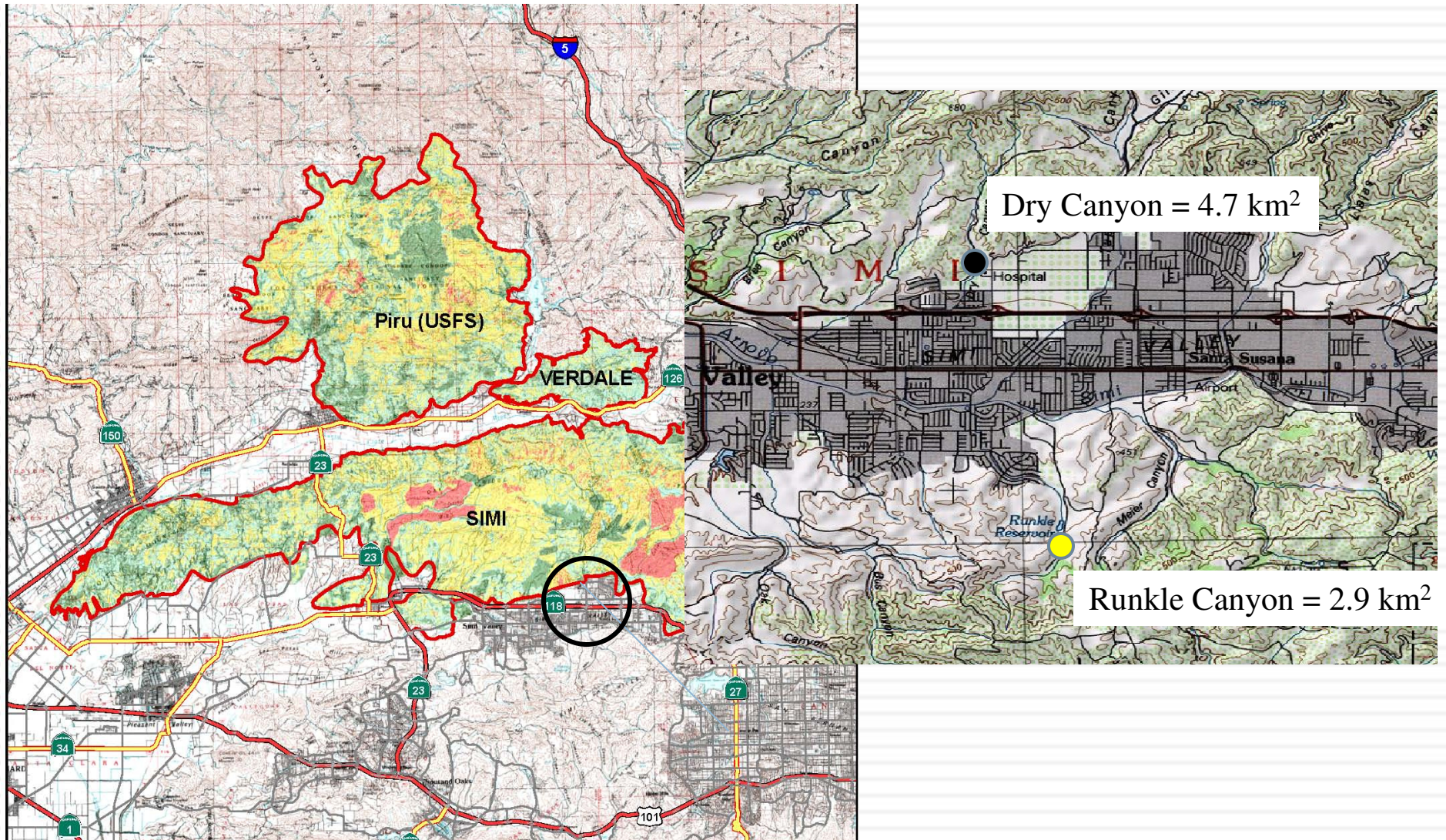
- 2003 Ballona Creek
 - ▣ No fire in the watershed
 - ▣ Substantial ashfall
 - ▣ Pre vs. post fire study
 - ▣ 3 storms pre fire + 3 storms post fire

Preliminary findings
Limited sample size

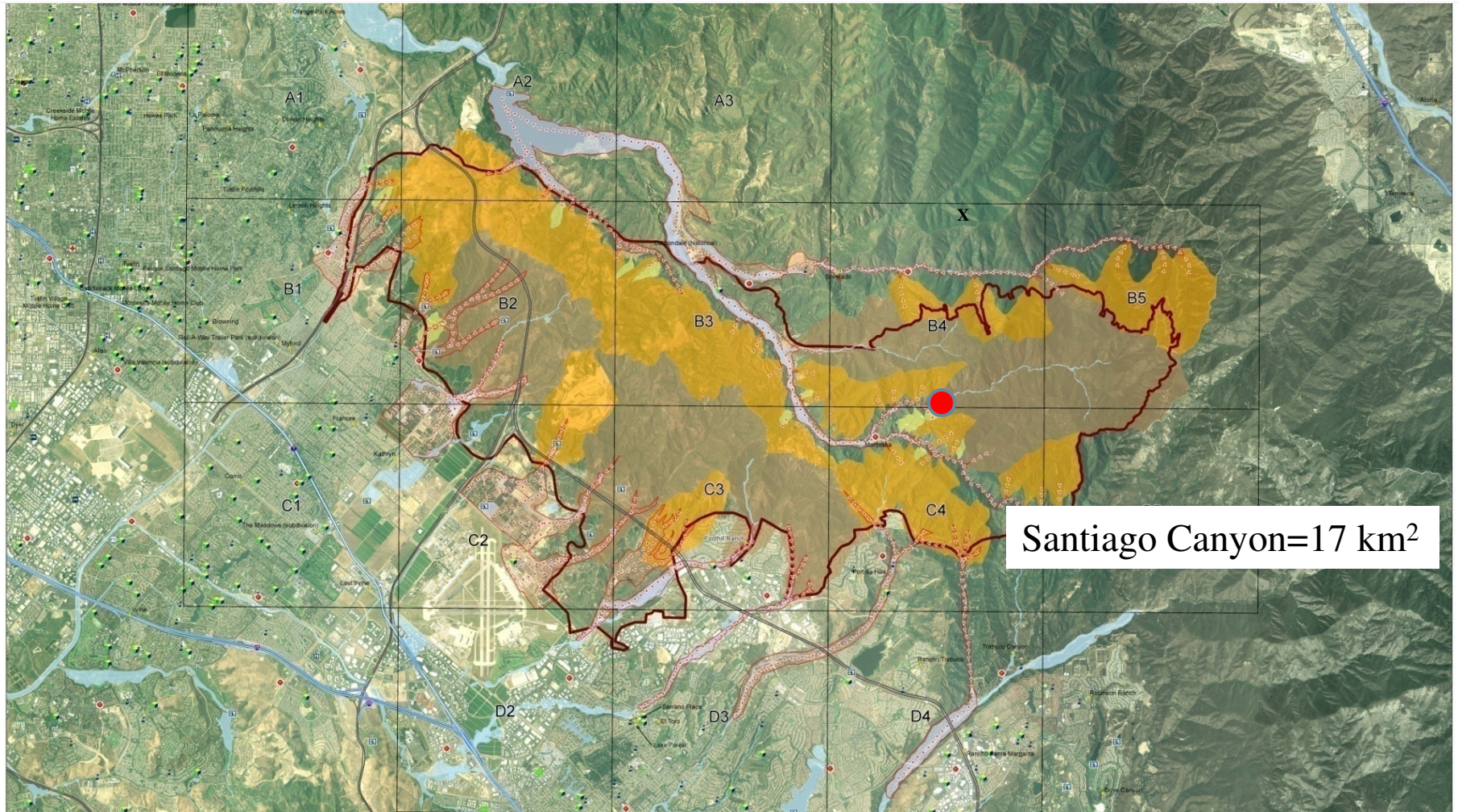
Study Locations



2003 Simi Valley Fire

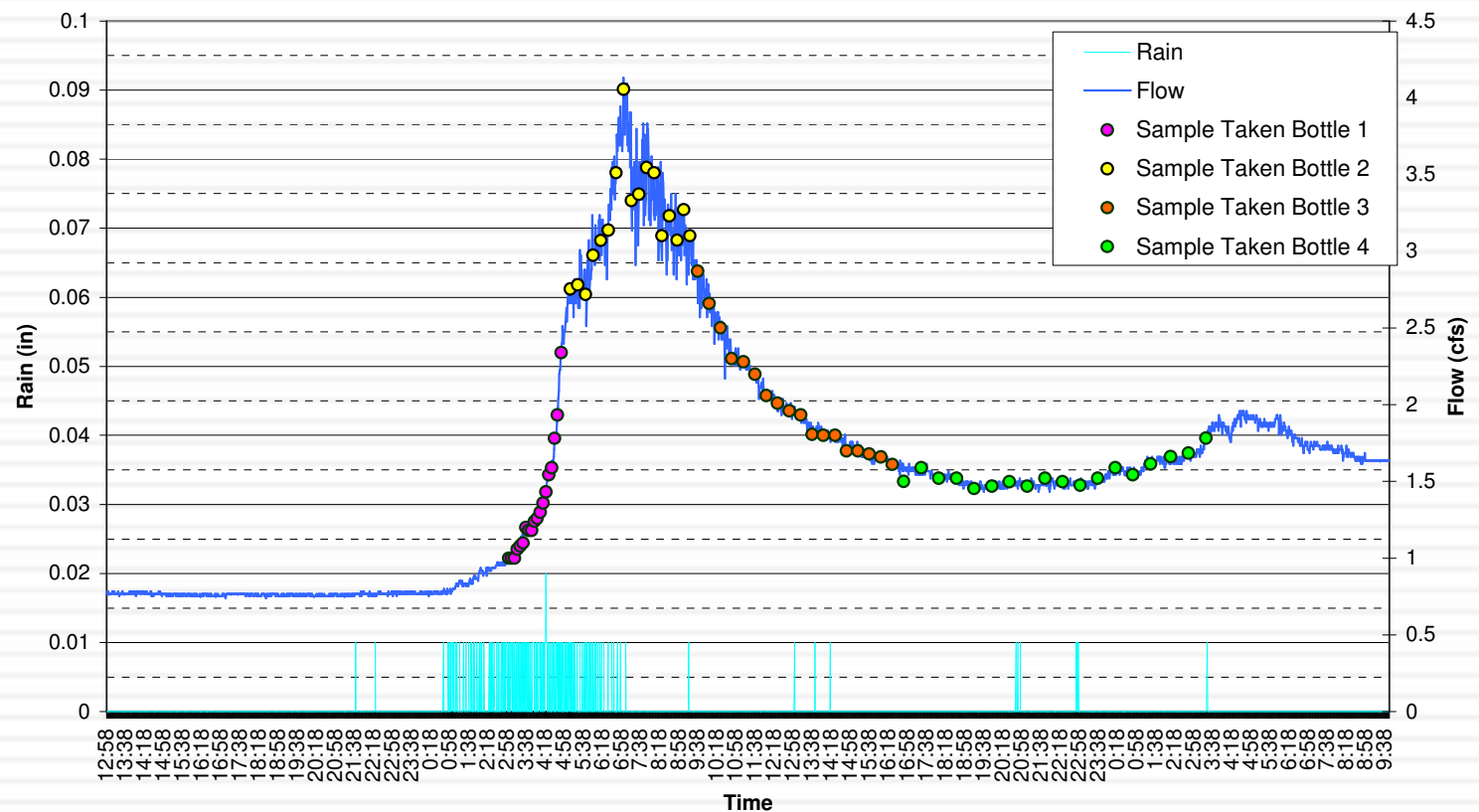


2007 Santiago Canyon Fire



Sampling Approach

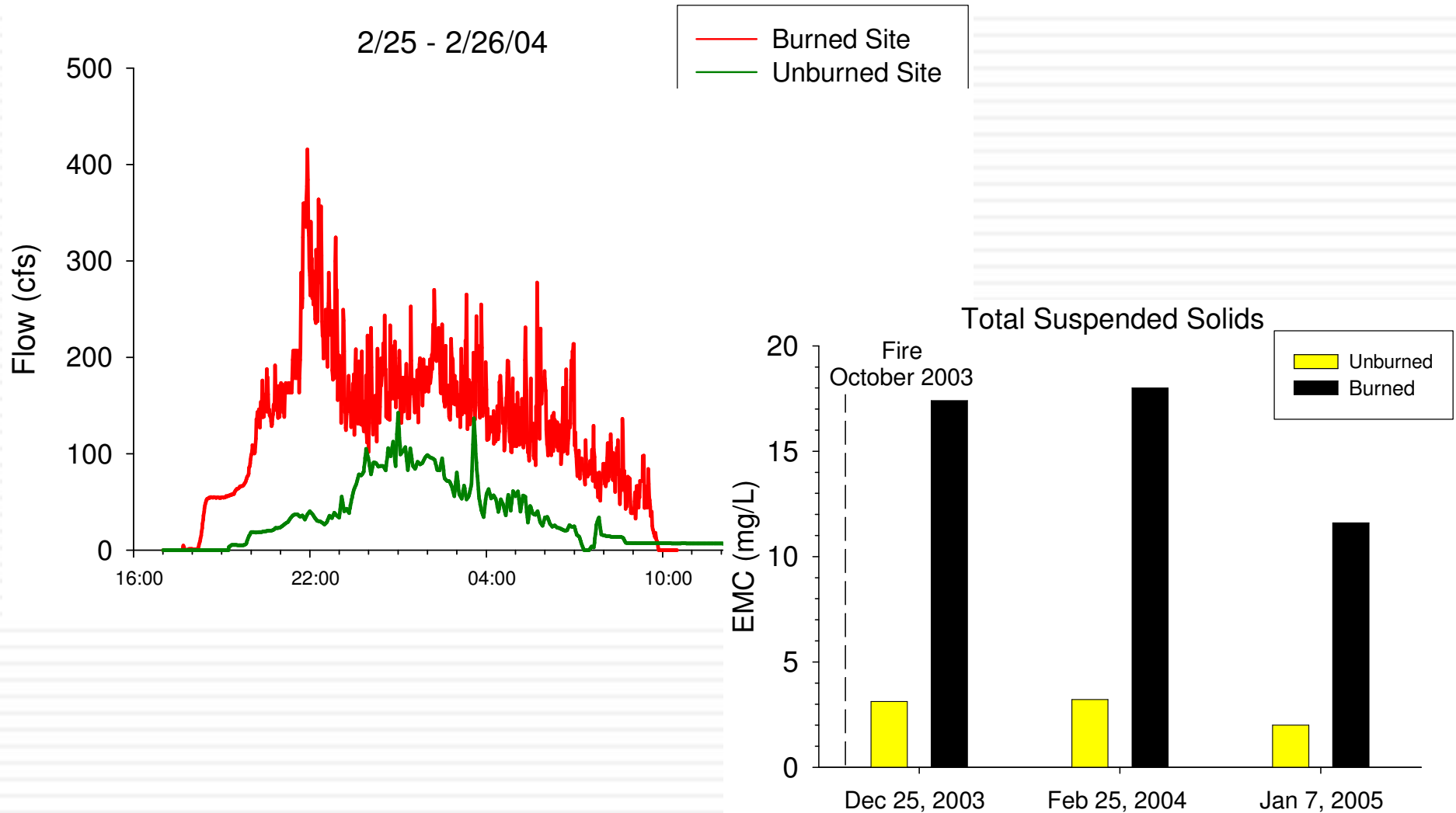
- Continuous flow monitoring
- Pollutograph sampling
- Focus on metals and PAHs



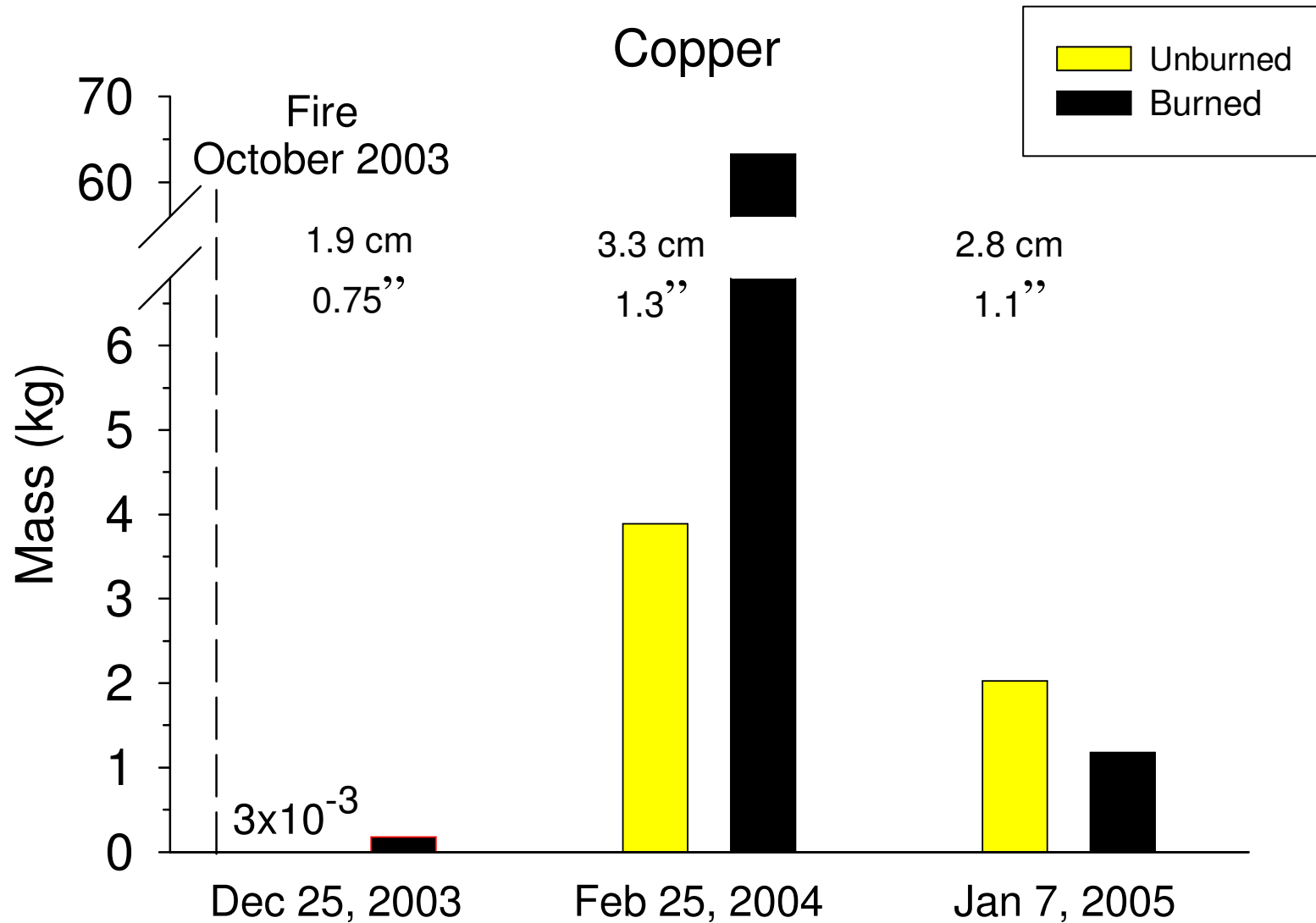
Direct Effects



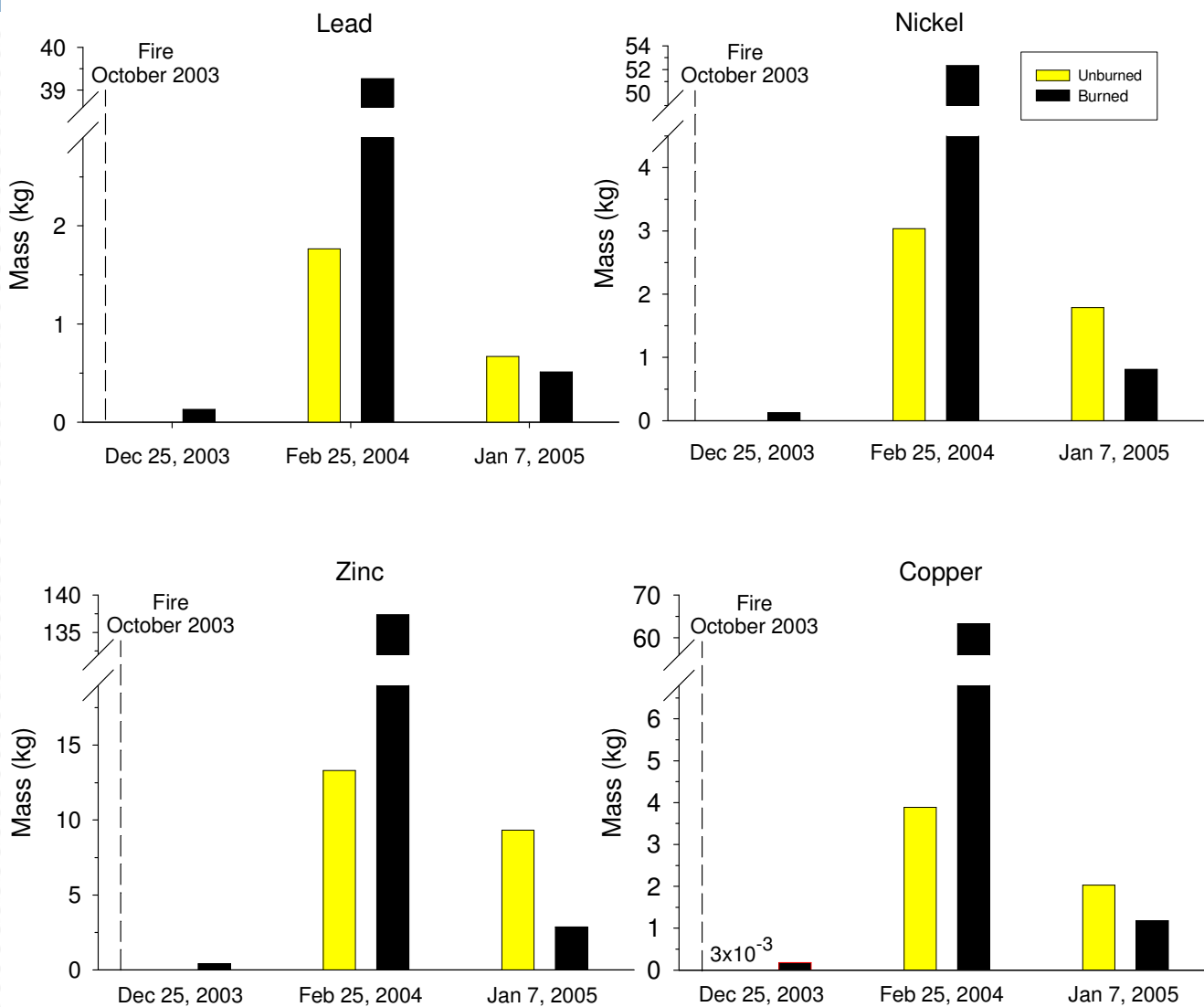
Fire Produces Higher Runoff and Sediment



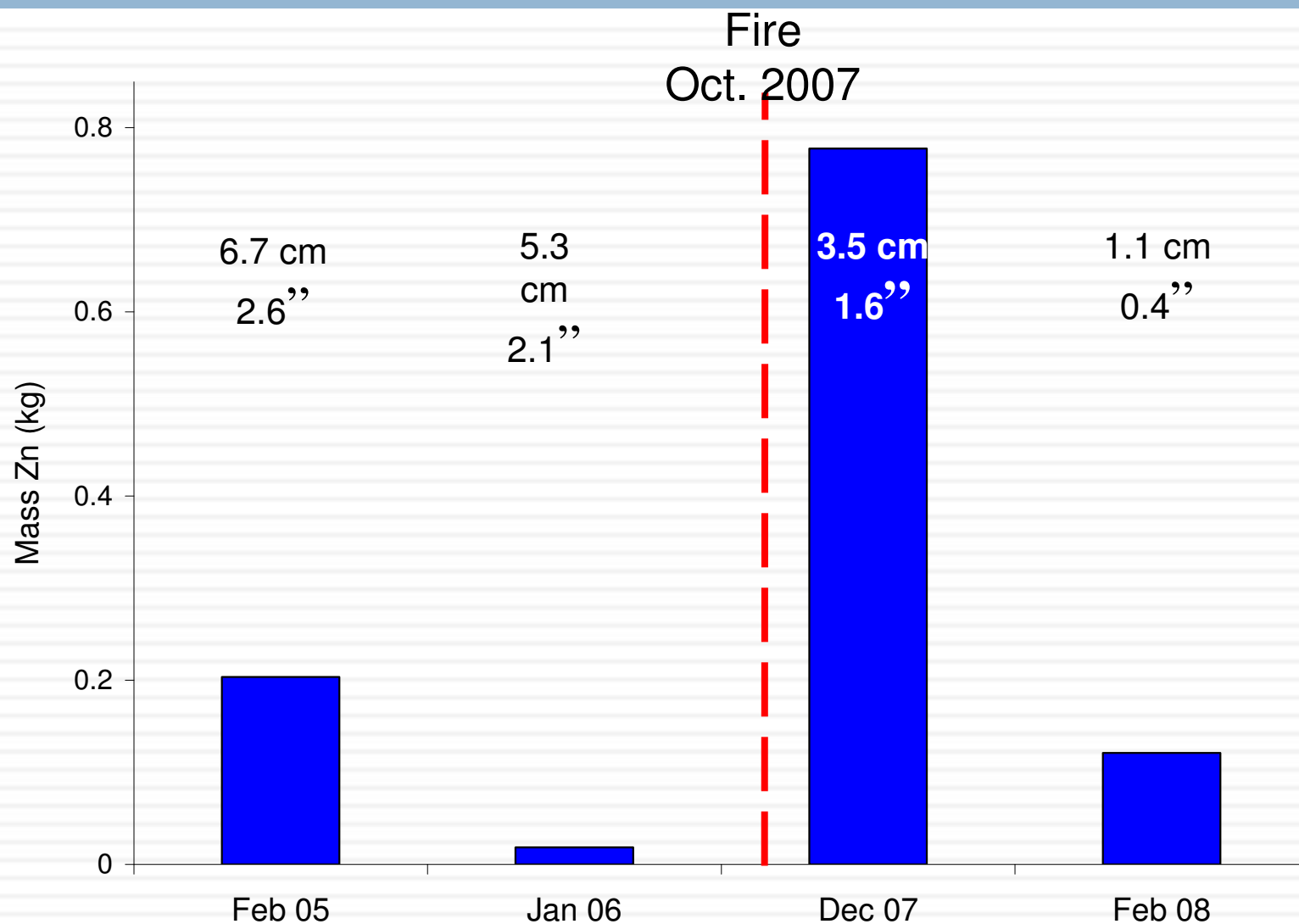
Post Fire Copper Loading



Post Fire Metals Loading



Post-Fire Zinc Loading



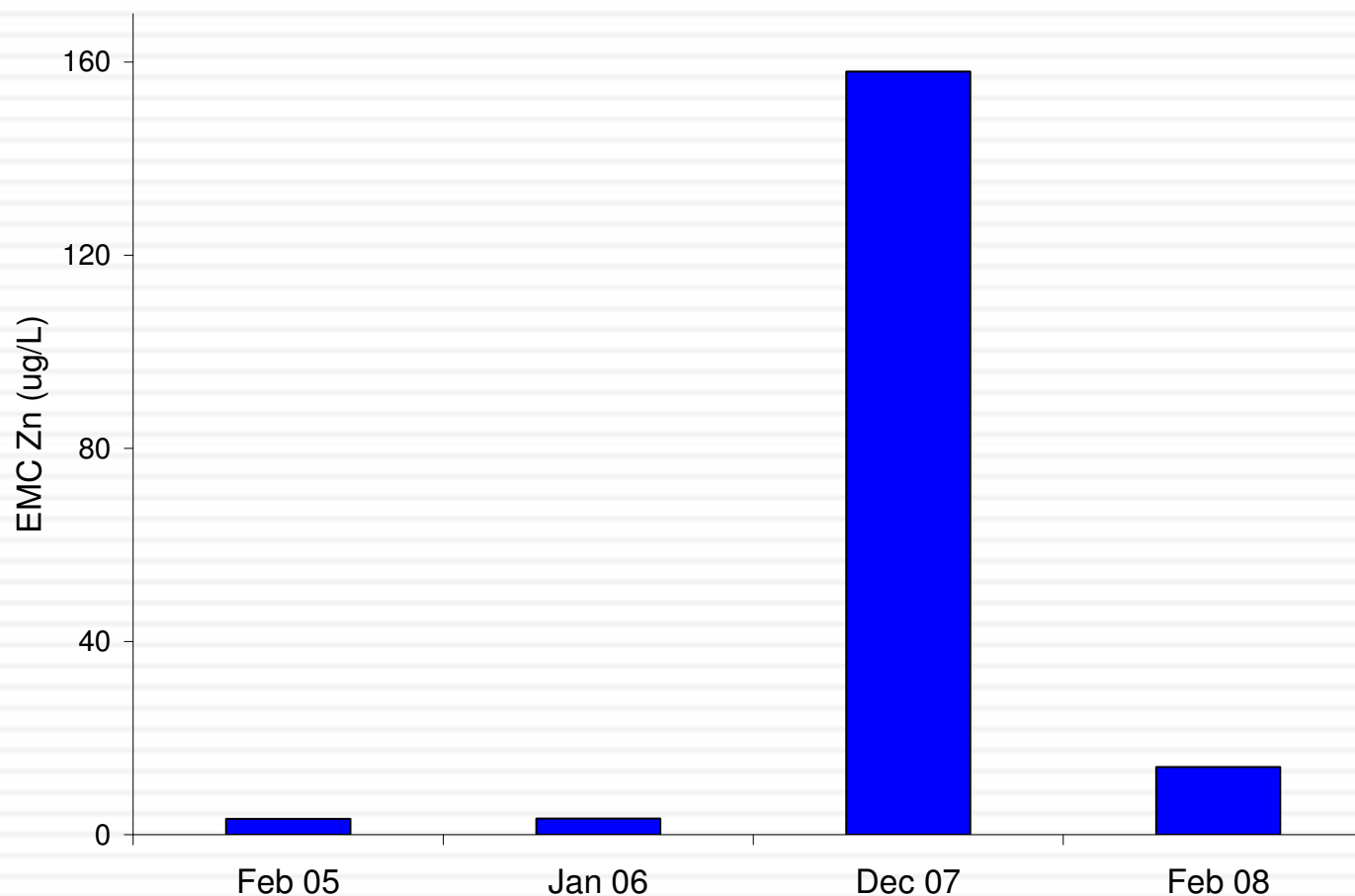
Fire Effect on Zinc Concentrations

Percent

37%

1%

4%



Effect of Fire on Total PAHs

	Not Influenced by Fire	Influenced by Fire
LA River	3500 ng/L	
Ballona Creek	3000 ng/L	5700 ng/L
Simi Valley	<100 ng/L	500-1200 ng/L
Open space (unburned)	150-700 ng/L	
Santiago Cyn (burned)		3400 ng/L

Indirect Effects



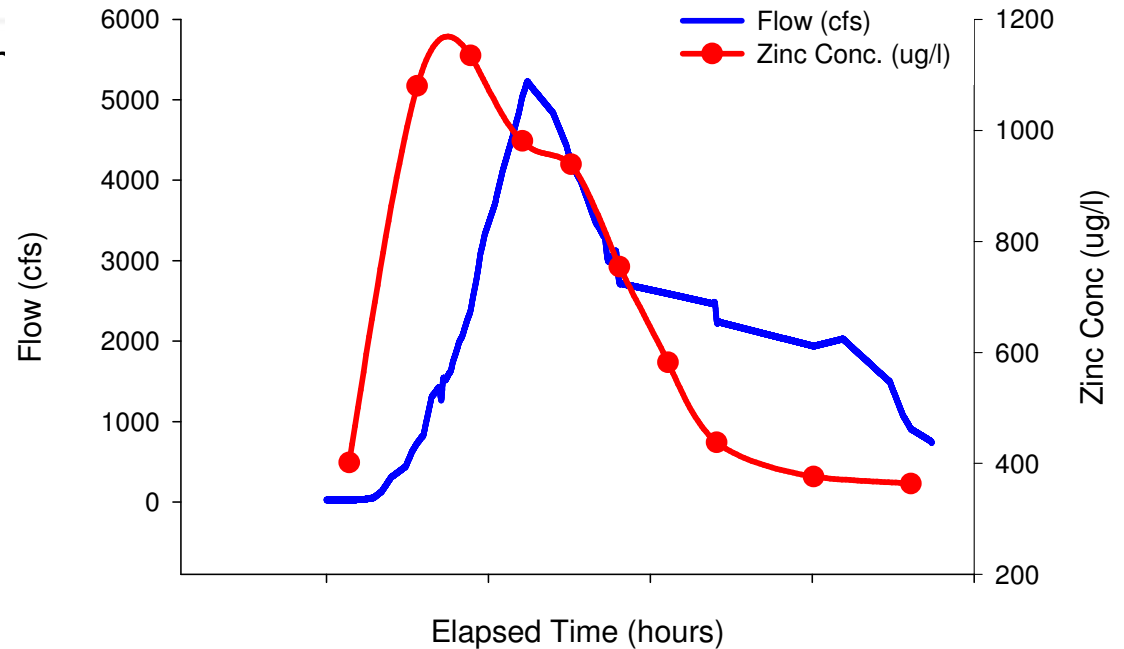
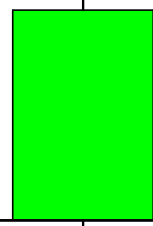
Zinc Concentrations in Ballona Creek

Zinc Concentration

pre-fire
post-fire

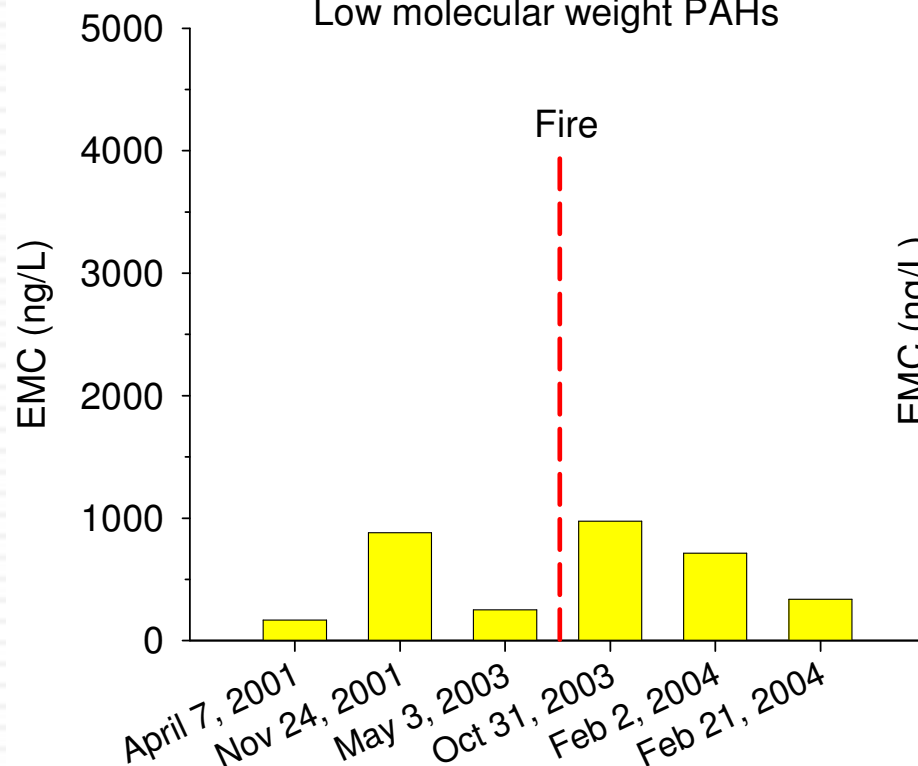
EMC (ug/l)

1200
1000
800
600
400
200
0

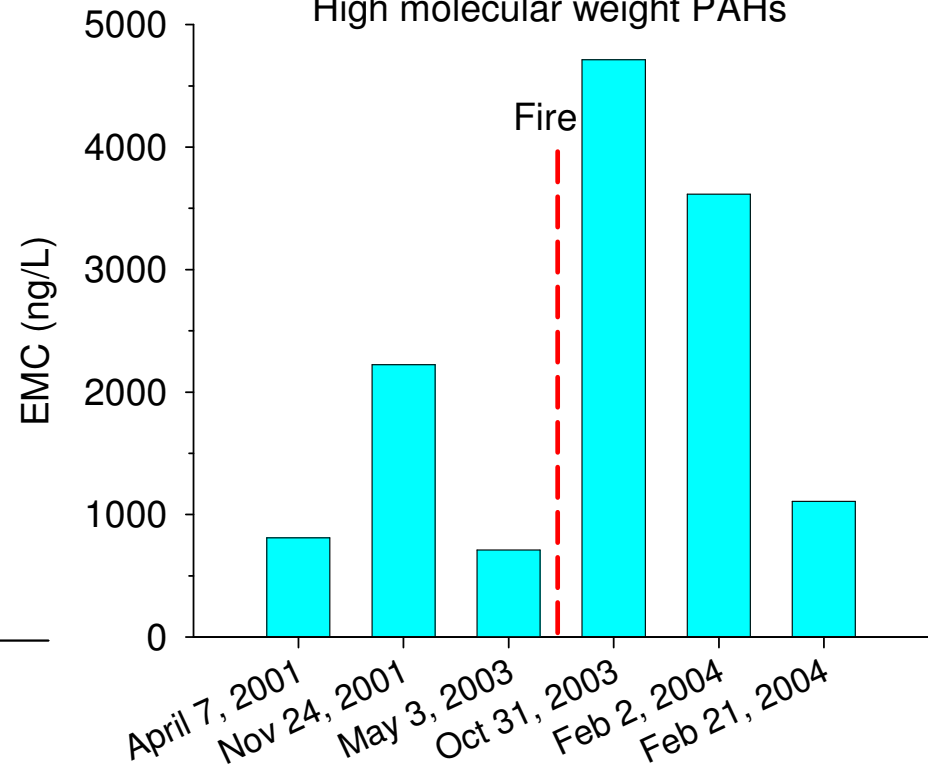


Indirect Effects of Fire on PAHs

Low molecular weight PAHs



High molecular weight PAHs



Peak Flow (cfs) 3561 13991 2767 5207 7554 3375

Conclusions and Next Steps

- Post fire runoff may contribute to increased metals and PAHs
 - ▣ Greater than ten-fold increase in mass and concentration in many situations
- Effects appear to be relatively short-live
 - ▣ Levels generally return to pre-fire levels within one year
- Indirect effects associated with ashfall can also lead to higher metals and PAHs
- Many data gaps
 - ▣ Particularly for biological and physical effects

Development of a Regional Post-fire Response Plan

- Difficulty in mobilizing, coordinating, and funding monitoring following fires
 - ▣ NEED a regional strategy
- Technical workshop on status of knowledge – **SUMMER 2008**
 - ▣ Identify and compile results of existing/past research
 - ▣ Determine key monitoring questions
- Develop post-fire response plan -- 2009
 - ▣ Monitoring approaches
 - ▣ Quality control
 - ▣ Data management and coordination
 - ▣ Implementation and funding strategy

QUESTIONS

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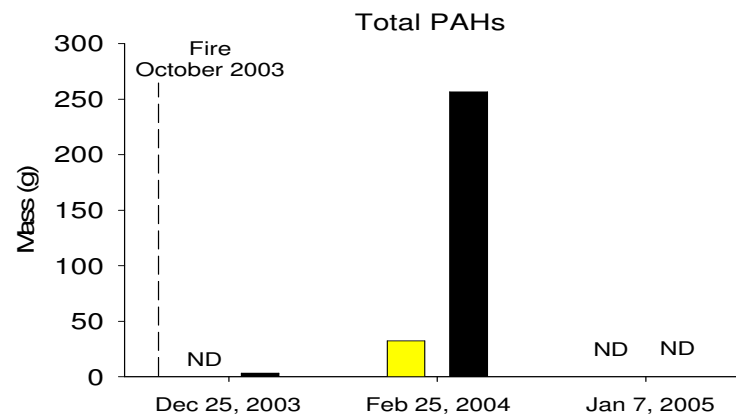
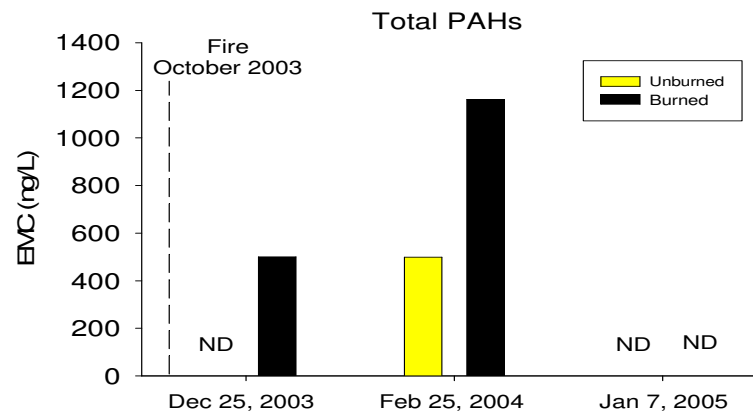
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San Gabriel Dam
August 2004 vs. April 2005

Simi Valley
Burned vs. Unburned Sites
Event Mean Concentrations & Mass





"Cabin buried by debris flow near San Gabriel Mountains."
Photo by Douglas M. Morton. Source:
<http://geology.wr.usgs.gov/wgmt/elnino/enimages/morton2.jpg>;
accessed May 31, 2006.